



DOCKET NO: 248157US77DIV

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
JIANMIN QIAO : EXAMINER: SCHILLINGER, LAURA M.
SERIAL NO: 10/765,072 :
FILED: JANUARY 28, 2004 : GROUP ART UNIT: 2813
FOR: DUAL DAMASCENE STRUCTURE :
AND METHOD OF MAKING

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal from the Final Rejection dated November 1, 2005, finally rejecting Claim 11 and, by implication, Claim 18 of the above-identified application.

I. REAL PARTY IN INTEREST

The real party in interest for this Appeal and the present application is Cypress Semiconductor Corporation of San Jose, California, United States, by Assignment recorded September 1, 2000, at Reel/Frame: 011073/0398.

II. RELATED APPEALS AND INTERFERENCES

There are no prior and pending appeals, interferences or judicial proceedings known to Appellants, Appellants' legal representatives or the Assignee, which may be related to, directly affect or be directly affected by or have a bearing upon the Board's decision in the pending Appeal.

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III. STATUS OF CLAIMS

Claims 11-12, 14 and 18 are pending in this application. Claims 1-10, 13 and 15-17 are canceled. Claim 11 and, by implication, Claim 18 are finally rejected and are on appeal. The appealed claims are set forth in the attached Claims Appendix. Claim 11 is independent. Claim 18 depends from independent Claim 11. Claims 12 and 14 are withdrawn from consideration pursuant to an Election of Species Requirement.

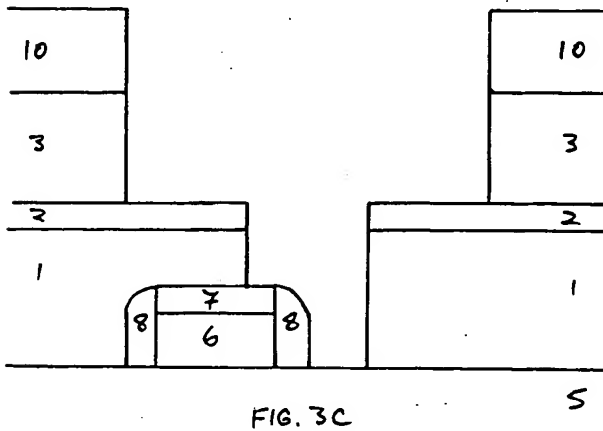
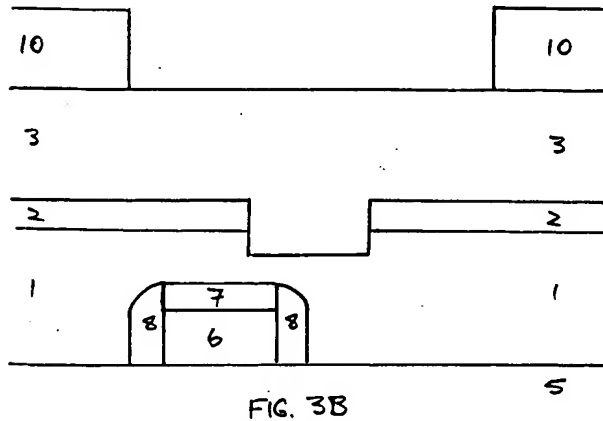
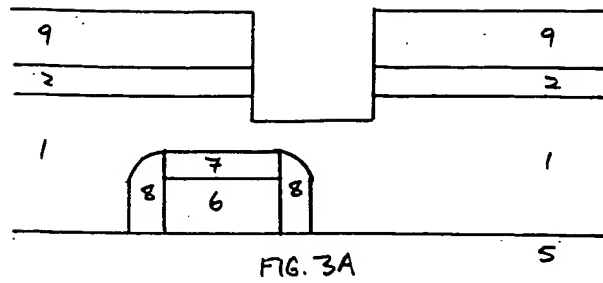
IV. STATUS OF AMENDMENTS

No Amendments have been filed following the Final Rejection dated November 1, 2005.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention provides a method of making a dual damascene structure using an etch chemistry containing $C_2H_2F_4$ that provides sufficient etch selectivity between undoped silicon oxide and various doped oxides for the undoped silicon oxide to act as an etch stop layer. Specification at page 4, lines 8-15.

In the embodiment of independent Claim 11 (and of withdrawn independent Claim 12), as illustrated in FIGS. 3A-3C, reproduced below, an etch stop layer 2 is deposited on a contact dielectric layer 1, a hole is formed through the etch stop layer 2, a trench dielectric layer 3 is deposited in the hole through the etch stop layer 2, and the trench dielectric layer 3 is etched with a chemistry containing $C_2H_2F_4$.



VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claim 11 and, implicitly, Claim 18, which depends from Claim 11, are rejected under 35 U.S.C. § 102(e) over U.S. Patent No. 6,399,512 ("Blosse").

VII. ARGUMENT

A. Independent Claim 1 is patentable under 35 U.S.C. § 102(e) over Blosse

Blosse discloses a method of making metallization and contact structures in an integrated circuit comprising an etch stop layer. Blosse at title. The Blosse method starts with the semiconductor structure shown in FIG. 1, reproduced below.

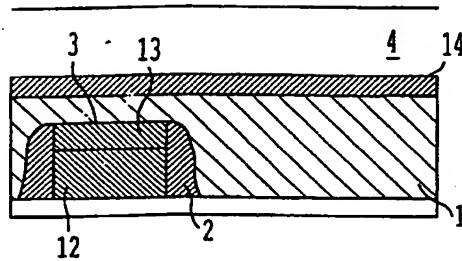


FIG. 1

The semiconductor structure illustrated in FIG. 1 includes a contact dielectric layer 1, an etch stop layer 14, and a trench dielectric layer 4. Blosse discloses sequentially etching, through contact opening mask 7, a hole through trench dielectric layer 4, etch stop layer 14 and contact dielectric layer 1, as shown in FIGS. 6-7, reproduced below.

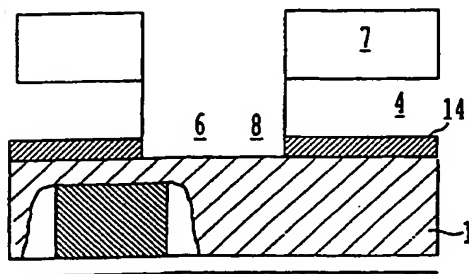


FIG. 6

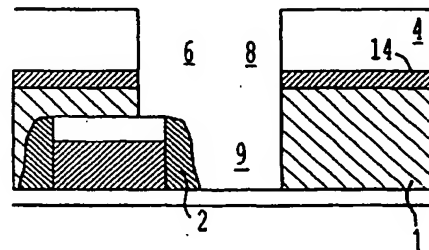
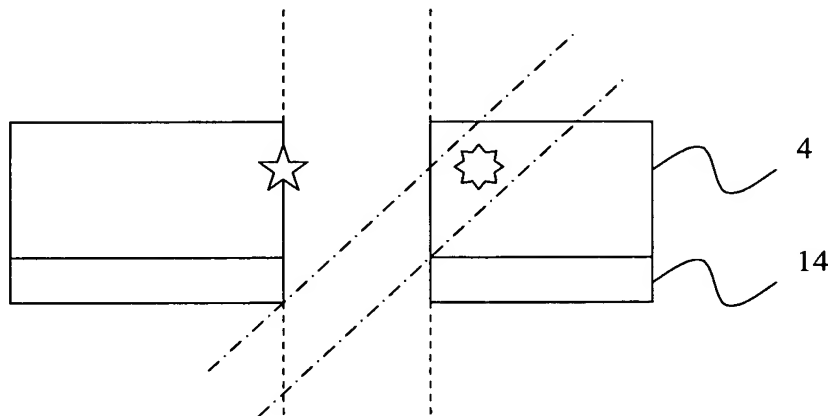


FIG. 7

However, Blosse fails to suggest the independent Claim 11 limitations of "selectively etching a trench dielectric layer and a contact dielectric layer in a structure comprising the trench dielectric layer, the contact dielectric layer, and an **etch stop layer** therebetween comprising undoped silicon oxide and **having a hole therein, the hole containing a trench dielectric layer material**, with an etch gas including $C_2H_2F_4$ ".

During the personal interview on July 26, 2005, the Examiner took the position (apparently repeated in the Final Rejection) that Blosse discloses the Claim 11 limitation of "an etch stop layer ... having a hole therein, the hole containing a trench dielectric material", because the trench dielectric layer material on the surface of the hole etched through Blosse's trench dielectric layer 4 is contained within the hole in Blosse's etch stop layer 14.

Thus, using the figure below for illustration, the Examiner has taken the position that the five-pointed star on the surface of the hole in trench dielectric layer 4 is contained within the hole in etch stop layer 14.



Apparently the Examiner considers any trench material encompassed by a cylinder (broken lines above) passing through the hole in etch stop layer 14 to be contained within the hole in etch stop layer 14. Using this criteria, the eight-pointed star shown above in the interior of trench dielectric layer 4 would also be contained within the hole in etch stop layer 14.

However, no skilled artisan would ever consider the hole in "an etch stop layer ... having a hole therein" to extend beyond the confines of the etch stop layer.

Blosse's etch stop layer 14 is flat. In order for Blosse's flat etch stop layer 14 to have a hole, as required by independent Claim 11, etch stop layer material must be removed from etch stop layer 14, leaving a region free of etch stop layer material between two planes respectively passing through the top and bottom surfaces of Blosse's flat etch stop layer 14. In order for this etch stop layer hole to contain trench dielectric layer material, also as required by independent Claim 11, the etch stop layer-free region between the two surface planes must contain trench dielectric layer material. Because the trench dielectric layer material of Blosse's trench dielectric layer 4 is adjacent to, but not contained between, the two planes respectively passing through the top and bottom surfaces of Blosse's flat etch stop layer 14, Blosse fails to suggest the independent Claim 11 limitations of "etching a trench dielectric layer and a contact dielectric layer in a structure comprising ... an etch stop layer ... having a hole therein, the hole containing a trench dielectric layer material".

Because Blosse fails to disclose or suggest all of the limitations of independent Claim 11, Claim 11 is patentable over Blosse.

B. Claim 18 is patentable under 35 U.S.C. § 102(e) over Blosse

Claim 18 is also patentable over Blosse. Claim 18 depends from Claim 11.

As shown in Blosse's Figs. 1 and 6-7 above, Blosse discloses etching contact dielectric layer 1 *after* etching through trench dielectric layer 4 and etch stop layer 14.

However, Blosse fails to suggest the Claim 18 limitation of "partially etching the contact dielectric layer *before* the trench dielectric layer is etched".

Because Blosse fails to disclose or suggest all of the limitations of Claim 18, Claim 18 is patentable over Blosse.

C. Conclusion

For the reasons discussed above, Appellants respectfully request that the Final Rejection of Claims 11 and 18 be REVERSED.

After independent Claim 11 is allowed, Applicants respectfully request rejoinder, examination and allowance of withdrawn Claims 12 and 14. Independent Claim 12 recites "forming a hole through the etch stop layer; depositing a trench dielectric layer ... in the hole through the etch stop layer". Thus, like independent Claim 11, independent Claim 12 features an etch stop layer having a hole containing a trench dielectric layer material. As discussed above, this feature is not suggested by Blosse.

Respectfully submitted,

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Attached:

Claims Appendix
Evidence Appendix
Related Proceedings Appendix
Proposed Findings of Fact
Proposed Conclusions of Law

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VIII. CLAIMS APPENDIX

Claims 1-10 (Canceled)

Claim 11 (Rejected): A method comprising selectively etching a trench dielectric layer and a contact dielectric layer in a structure comprising the trench dielectric layer, the contact dielectric layer, and an etch stop layer therebetween comprising undoped silicon oxide and having a hole therein, the hole containing a trench dielectric layer material, with an etch gas including $C_2H_2F_4$.

Claim 12 (Withdrawn): A method of forming an interconnect structure, the method comprising

depositing an etch stop layer, containing an undoped silicon oxide, on a contact dielectric layer containing a first oxide comprising silicon;

forming a hole through the etch stop layer;

depositing a trench dielectric layer, containing a second oxide comprising silicon, on the etch stop layer and in the hole through the etch stop layer;

forming a trench in the trench dielectric layer and a hole through the contact dielectric layer by etching the first and second oxides; and

depositing an electrically conductive interconnect in the trench, the hole through the etch stop layer and the hole through the contact dielectric layer, wherein

forming the trench comprises etching the second oxide with a chemistry containing $C_2H_2F_4$.

Claim 13 (Canceled)

Claim 14 (Withdrawn): The method according to Claim 12, wherein forming the hole through the etch stop layer comprises etching with a chemistry containing at least one of C_xF_y (where $x = 1-6$, and $y = (2x-2)$, $2x$ or $(2x+2)$, but is at least 4) and $C_aH_bF_c$ (where $a = 1$ or 2 , $b = 0-2$, and $c = (2a+2-b)$).

Claims 15-17 (Canceled)

Claim 18 (Rejected): The method according to Claim 11, wherein the method further comprises partially etching the contact dielectric layer before the trench dielectric layer is etched.

IX. EVIDENCE APPENDIX

None

X. RELATED PROCEEDINGS APPENDIX

None

XI. APPENDIX - PROPOSED FINDINGS OF FACT

1. Blosse does not suggest the independent Claim 11 limitation of an "etch stop layer ... having a hole therein, the hole containing a trench dielectric layer material".

2. Blosse does not suggest the Claim 18 limitation of "partially etching the contact dielectric layer before the trench dielectric layer is etched".

XII. APPENDIX - PROPOSED CONCLUSIONS OF LAW

1. The claimed subject matter is not anticipated under 35 U.S.C. § 102 by Blosse.
2. The claimed subject matter is patentable over Blosse.